## REMARKS/ARGUMENTS

### A. Concerning the Amendments

Claim 8 has been rewritten in independent form to contain all of the limitations of Claim 1 from which it depended.

Claim 9 has been rewritten in independent form to contain all of the limitations of Claim 1 from which it depended.

New Claim 45, depending from Claim 8, finds support at page 20, lines 20-30, of the specification.

New Claim 46, depending from Claim 8, finds support at page 16, lines 16-20, of the specification.

New Claim 47, depending from Claim 9, finds support at page 20, lines 20-30, of the specification.

New Claim 48, depending from Claim 9, finds support at page 16, lines 12-16, of the specification.

Support for new Claims 49, 50, and 51 is found at page 20, lines 20-28, of the specification.

Applicants estimate that a fee of $750.00 is required for entry of the new claims. A fee sheet is enclosed herewith authorizing the Examiner to debit Deposit Account 04-1512 the required fee. If the estimate is incorrect, the Examiner is authorized to debit or credit the account accordingly.

### B. Regarding the Rejection of Claims 1 to 6 for Lack of Novelty

The Office Action rejects Claims 1 to 6 under 35 U.S.C. 102(b) for lack of novelty over DE 4,107,056 and WO-96/04289, for the reasons of record. An English-language translation of DE 4,107,056 was sent to the US Patent Office in Applicants' Information Disclosure Statement, filed December 3, 2004.

In Claims 1 to 6, Applicants claim a fatty acid or fatty acid ester composition comprising one or more unsaturated fatty acids or unsaturated fatty acid esters, characterized as comprising less than 3.0 milliequivalents of metathesis catalyst poison(s) per kilogram of fatty

acid or fatty acid ester composition. Organic hydroperoxides are a typical metathesis catalyst poison.

DE 4107056 discloses at Examples 1 to 3, a fatty acid ester, namely, 10-undecylenic acid ester. The cited reference is totally silent with respect to compositional purity. No treatment of the fatty acid ester is disclosed, for example, to remove metathesis catalyst poisons. The undecylenic acid ester is taught to be metathesized with a lower olefin, namely 4-octene, in the presence of a rhenium oxide catalyst.

Likewise, WO 96/04289 discloses at page 17 (section 9) oleic acid. WO 96/04289 is totally silent with respect to compositional purity. No treatment of oleic acid is disclosed, for example, to remove metathesis catalyst poisons. The oleic acid is taught to be cross-metathesized with ethylene in the presence of a ruthenium catalyst.

Neither reference discloses or suggests the presence of metathesis catalyst poisons, such as organic hydroperoxides, aldehydes, ketones, or water, as being present in the unsaturated fatty acid or unsaturated fatty acid ester composition, much less in any specific concentrations of such poisons. *Silence in a reference is never a proper substitution for facts.* The skilled artisan is well aware that such poisons are *certain to exist inherently* in an unsaturated fatty acid or fatty acid ester sample not handled with extreme care. Any standard organic chemistry textbook teaches that olefinically-unsaturated compounds are oxidized by oxygen in air to produce organic hydroperoxides. This oxidation to form organic hydroperoxides with subsequent formation of aldehydes and ketones is a source of the well-known rancidity of fats and oils (fatty acids/esters). Water is also typically present in air. Accordingly, in the absence of facts disclosing special handling to avoid or remove contact with oxygen and water, the skilled artisan may properly conclude that the prior art samples were purchased commercially and simply used "as is" or "off the shelf." To Applicants' best knowledge based on testing numerous commercial samples of unsaturated fatty acids and fatty acid esters, such routinely-handled samples *inherently* contain significantly greater than about 30 milliequivalents catalyst poisons, e.g., organic hydroperoxides and/or water, per kg (meq/kg).

Although comparative data typically are used against 103 rejections, in this instance, comparative data may be helpful in assessing further what the cited references inherently disclose about catalyst poisons, which is a 102 issue. The Examiner's attention is

directed to Example 1 of DE 4107056, wherein a molar ratio of fatty acid ester to metathesis catalyst is taught to be 200:1. In practical terms, this number represents a very large quantity of catalyst. At a disclosed conversion of 81 percent, a catalyst turnover number (CTN) can be calculated as (200 x 0.81) or only 162 moles of ester converted per mole catalyst.

Likewise, the Examiner's attention is directed to Example 3 of DE 4107056, wherein a molar ratio of fatty acid ester to metathesis catalyst is taught to be 600:1. In practical terms, this ratio still represents a large quantity of catalyst. At a disclosed conversion of 79 percent, a CTN can be calculated as (600 x 0.79) or only 474.

The Examiner's attention is directed to page 17 (section 9) of WO 96/04289, to the example wherein 0.91 grams of oleic acid (MW 282.5; 0.00322 moles or 3.22 mmoles) and 10 mg $Cl_2(PCy_3)_2Ru{=}CH\text{-}CH\text{-}CPh_2$ (MW 888.8; 0.0113 mmoles) are used, which results in a fatty acid/catalyst molar ratio of 285/1. At 75 percent conversion (25 percent unconverted oleic acid), the moles of converted fatty acid ester are calculated as 0.00322 x 0.75 = 0.0024 moles or 2.4 mmoles. Thus, the CTN is calculated as (2.4/0.0113) or only 213. Practically, the quantity of catalyst is again large.

Based on the aforementioned prior art teachings towards use of a large quantity of catalyst relative to unsaturated fatty acid/ester, the skilled artisan would conclude that the prior art catalysts were most likely quite inactive. Moreover, it would be concluded that the prior art attempts to compensate for catalyst inactivity by raising the concentration of catalyst, so as to obtain a measurable activity, even if at a lower catalyst turnover number. The prior art approach cannot be tolerated if seed oil technologies are to be commercialized.

In contrast, Applicants are the first to realize that when unsaturated reactant feedstocks contain metathesis catalyst poisons at levels much higher than about 100 meq/kg, catalytic activity is significantly diminished, if not completely destroyed. Below about 100 meq/kg and above about 10 meq/kg, activity may vary depending upon the specific form of the catalyst and concentration of poisons. Generally, however, all metathesis catalysts were found to benefit considerably from reducing the catalyst poison levels below about 10 meq/kg, and even more preferably, below about 3.0 meq/kg. The effect is seen clearly in Applicants' own Comparative Experiment 1 at Table 1 of the specification, wherein at a desirably high molar ratio of oleic acid methyl ester to ruthenium catalyst, specifically 4,500/1 (i.e., lower catalyst

concentration), the catalyst shows no activity at all (CTN = 0) when the peroxide concentration is 305 meq/kg.

The aforementioned data calculated from the cited references and taken from Applicants' comparative experiment are tabulated hereinafter.

**Table.** Effect of hydroperoxide concentration (ROOH) on catalyst turnover number (CTN)

| Example | [ROOH] (meq/kg) | MO/Cat[a] Mole Ratio | CTN (moles MO reacted per mole catalyst) |
|---|---|---|---|
| DE4107056[b] (Ex. 1) | - | 200 | 162 |
| DE4107056[b] (Ex. 3) | - | 600 | 474 |
| WO96/04289[b] (p. 17/9) | - | 285 | 213 |
| CE-1[c] | 305 | 4500 | 0 |
| E-1[c] | 0.70 | 4500 | 2,160 |
| E-2[c] | 0.30 | 4500 | 2,565 |

*a. MO = methyl oleate; Cat = catalyst*
*b. Calculated from data in reference.*
*c. Data reproduced from Table 1 of specification.*

More to the point, Applicants discovered that catalyst activity can be maintained at desirably higher molar ratios of unsaturated reactant to catalyst with desirably higher catalyst turnover numbers, when the feedstock composition comprises less than about 100 meq/kg, and more particularly, less than about 10 meq/kg, and most preferably, less than about 3.0 meq/kg catalyst poisons. Referring to Table 1 of Applicants' specification, Examples E-1 and E-2 illustrate catalyst turnover numbers of 2,160 and 2,565 at a desirable molar ratio of oleic acid methyl ester to ruthenium catalyst of 4,500/1 and hydroperoxide concentrations of only 0.70 or 0.30 milliequivalents per kg, respectively. See Table hereinabove.

Applicants submit that although silence in a prior art reference may not offer incontrovertible proof of patentability of a claim, the illustrations in the instant references and the application offer convincing evidence that the prior art samples were *inherently contaminated*

*with catalyst poisons, e.g., organic hydroperoxides,* at a concentration above and outside the upper limit of the claims. Accordingly, composition Claims 1-6, which pertain to compositions containing very low levels of metathesis catalyst poisons, meet the standards for novelty. It is respectfully requested that the rejection of Claims 1-6 over DE 4,107,056 and WO-96/04289 be withdrawn.

**C. Regarding Supplementary Information Disclosure Statements**

Applicants thank the Examiner for returning with the First Office Action a copy of Form PTO-1449, which was originally filed in Applicants' Information Disclosure Statement dated December 3, 2004, and which now has been reviewed and initialed by the Examiner. We note that a second Form PTO-1449 was filed by Applicants with a Supplementary Information Disclosure Statement on December 7, 2004, and a third Form PTO-1449 was filed with a Supplementary Information Disclosure Statement on April 20, 2005. The undersigned has not yet received Examiner-initialed copies of Forms PTO-1449 from the December 7, 2004 and April 20, 2005 submissions. Applicants respectfully request return copies of the latter two Forms initialed by the Examiner to indicate that the citations therein have been considered.

**D. Conclusions**

Applicants acknowledge with gratitude the Examiner's finding Claims 7-44 to be allowable. In view of the above, it is submitted that all of Claims 1-44 and new Claims 45 to 51 meet the statutory requirements for patentability. A Notice of Allowance is requested at the Examiner's earliest convenience.

Respectfully submitted,

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Enclosure (Fee Authorization Sheet)
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